

Title of project:**Preliminary assessment of differences in Christmas tree species to root rot**

Project leader: Brian Eshenaur

Cooperators: Susanne Stokoe, Shawn Kenaley, George Hudler

Abstract: Among the Christmas tree species grown in NY, Fraser fir has become popular and is now considered a premium tree for both consumers and Christmas tree growers. Unfortunately tree death through a sudden decline has also become common on Fraser fir on many NY tree farms. The areas of greatest tree death appear to be associated with low lying portions of fields. In other states, *Phytophthora* species have been associated with similar tree death in Fraser firs.

This field project was conducted in a one year old Fraser fir planting in which trees were experiencing root decline. In addition to a control planting of replacement Fraser firs, Cannan, Concolor and Turkish firs were planted in replicated blocks to determine if there is variation in susceptibility to this root decline. Initial results indicate a higher survival rate among these alternate species as compared with replacement Fraser firs.

Samples also were removed from the field for isolation of pathogens. Three species of *Phytophthora* were found associated with the roots in this study. Characterizing the disease organisms and resistant species will be important factors in the management of this problem.

Justification: Christmas tree farming is a multi-million dollar industry in temperate regions of the U.S.; providing fresh-cut trees for decoration and live specimens for transplant. In the most recent USDA Census of Agriculture, NYS is seventh in the U.S. for Christmas tree producers (844 farms) and total trees harvested (348,043 trees) – an estimated farm gate and consumer retail value of \$8.8 and \$14.2 million, respectively. Christmas tree farmers in NY and elsewhere in the Northeast are increasingly growing Fraser fir (*Abies fraseri*) as their major crop tree because the species has excellent needle color and retention and it shapes well when sheared. It is also relatively free of pests and pathogens, thus needing minimal grower investment in pest management during its 8-12 year rotation. Unfortunately, the sudden death of young Fraser fir (1-2 yrs. post-plant) has become a serious problem in Christmas tree farms in much of the State, especially where soils are heavy or poorly drained. Phytophthora root rot caused by *P. cinnamomi* is a well-documented nemesis for Fraser fir seedling producers in the Carolinas where it is responsible for the death of 30-90% of trees at some sites. However, that pathogen purportedly does not survive in frozen soil and should not occur in NY on trees that are more than 1-yr post-transplant. There may have been some selection for cold-tolerant strains of the *P. cinnamomi* over time, but a more plausible concern is that the population of *Phytophthora* spp. endemic to northeastern soils is more diverse than previously thought and within that diverse population are one or more pathogens of *A. fraseri* other than *P. cinnamomi*. At least four other *Phytophthora* spp. are known to be pathogenic on *Abies* elsewhere in the U.S., and one or more of these may be having a greater than expected impact on fir health in NY.

Objectives:

This project was designed to learn more about the cause of the Fraser fir death common throughout NY. A variety trial conducted in fields infested with *Phytophthora* will help determine which tree species have varying levels of natural resistance to this pathogen. Through field work with dead and dying trees the pathogen(s) will be isolated and identified.

Procedures:

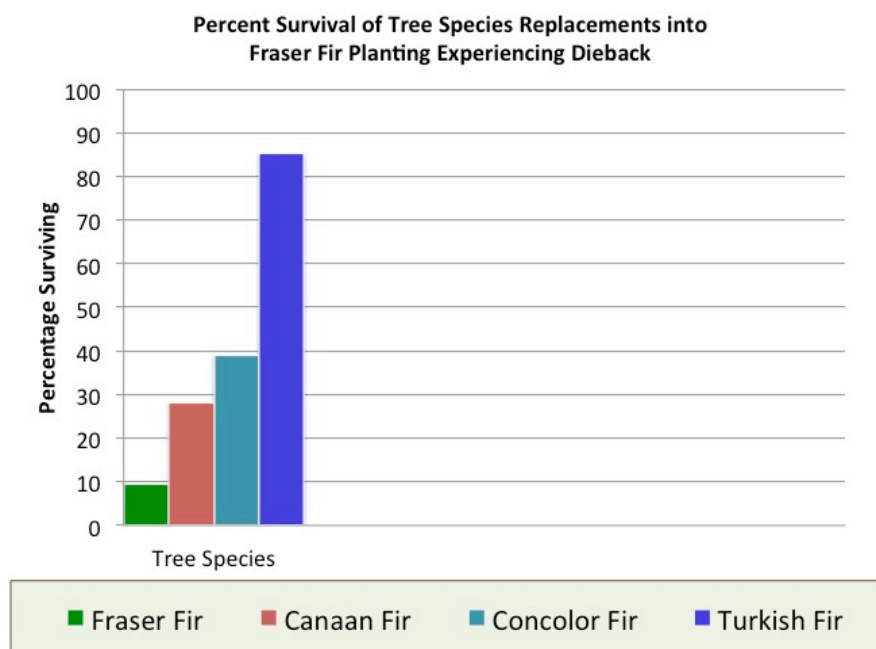
A one-year-old field of Fraser firs exhibiting significant root rot in Monroe County NY was selected for this project. In March of 2012 three alternative species as well as a check row of Fraser fir were planted in the sites where trees had died. Each species of replacement trees was planted among existing trees in 3 replicated rows. The species planted were Concolor fir (*Abies*), Turkish fir (*Abies*), Cannaan fir (*Abies*) and Fraser fir (*Abies*) as a control. The trees were evaluated through the 2011 growing season. At the three assessment times in the 2011 growing season all of the 812 trees in the plot were examined for above ground symptoms. Samples of specimen trees that died were sent to the Plant Pathology department for *Phytophthora* species identification.

Results to date:

Phytophthora species isolated from symptomatic Fraser fir at this field plot:

- *Phytophthora cactorum* (2 isolates; canker and soil)
- *Phytophthora cryptogea/drechsleri* (3 isolates; roots and soil)
- *Phytophthora citricola* (1 isolate; roots)

Results of the variety trial at the end of the season are presented here:



Fraser fir replants had less than 10% survival, Cannaan fir less than 30%, concolor less than 40% and Turkish fir had over 80% survival.

Implications:

These initial results can help growers select tree species that survive in sites where Fraser fir has died. Future identification of the *Phytophthora* species involved may also help growers with management decisions. To follow-up on this important issue we recently collaborated on a recent grant proposal with Cornell plant pathologists George Hudler and Shawn Kenaley to conduct further work on this issue.